

Yellowtail Powerplant Pick-Sloan Missouri Basin Program

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Reclamation Region:	Great Plains
NERC Region:	Western Electricity Coordinating Council, Rocky Mountain Power Area and Mid-Continent Area Power Pool
PMA Service Area:	Western Area Power Administration, Rocky Mountain Region and Upper Great Plains Region
Project Authorization:	Construction of the Yellowtail Unit, part of the Pick-Sloan Missouri Basin Project Eastern and Western Divisions, was authorized by the Flood Control Act of December 22, 1944, Public Law 534, which approved the general comprehensive plan set forth in Senate document 191, as revised by Senate Document 247, 78 th Congress.
Project Purposes:	The Yellowtail Unit is a multi-purpose project which provides low cost power generation and makes an important contribution to the flood control, irrigation, and power supply in the Missouri Basin.
Plant Location:	Yellowtail Dam, Powerplant, and Afterbay Dam, the principle structures of the Yellowtail Unit, are located on the Bighorn River, in south-central Montana, approximately 45 miles southwest of Hardin, Montana, and 90 miles southeast of Billings.

Yellowtail Powerplant
100-500 MW

Plant Purpose:	Yellowtail Powerplant, with an installed capacity of 250,000 kilowatts, provides low cost power and supplies expanding power needs for residential and commercial use in a wide surrounding area. The widely varying releases from the powerplant are regulated by the Yellowtail Afterbay Dam, constructed 2.2 miles downstream. The afterbay, with a capacity of 3140 acre-feet, minimizes downstream fluctuations in the Bighorn River by providing a uniform daily flow, leveling the peaking power discharges from the powerplant.
Plant Facts:	Yellowtail Powerplant is located at the downstream toe of the dam on the right abutment. Four 12-foot diameter penstocks embedded in the dam supply water to four 87,500 horsepower, vertical-shaft, Francis-type hydraulic turbines each driving a 62,500-kilowatt generator. Yellowtail's annual power generation over the last 10-years has averaged 974,400,000 kilowatt-hours. Yellowtail Dam, at the mouth of Bighorn Canyon, is a concrete structure rising 525 feet above the rock foundation and impounds flows of the Bighorn River for multi-purpose use. Bighorn Lake is about 72 miles long with a total capacity of 1,328,360 acre feet.
Plant History:	Construction on Yellowtail Dam and Powerplant began in May 1961 and was completed in December 1967; construction of the Afterbay Dam was started in April 1964 and was completed in November 1966. Operation of Units 3 and 4 began in August 1966, followed by Unit 2 in October 1966, and Unit 1 in November 1966. Units 1 and 2 (115-kV) are part of the Western Division of Pick-Sloan Missouri Basin Program, and Units 3 and 4 (230-kV) are part of the Eastern Division.
Present Activities:	<p>The Bighorn River Basin experienced its fourth consecutive year of drought conditions, resulting in below average power generation in FY2000 through FY2003.</p> <p>FY2003 activities included testing of new governors and excitation systems; new transformer differential relays installation, testing of new powerplant optimization system, Unit 3 Quad maintenance, and transformer maintenance and testing.</p>
Future Activities:	Major activities planned in the near future include replacement of the unit air circuit breakers; unit high-pressure air compressors replacement; powerplant 480 Vac distribution motor control center replacement; power penstocks coating repairs; installation of a new 13.8-kV overhead Afterbay Dam line; modernization of the powerplant and dam elevators; spillway tunnel concrete repairs; and replacement of the powerplant roof.
Special Issues:	Responsibilities, in addition to the operation and maintenance of the 250,000-kilowatt powerplant, also include the operation and maintenance of two dams, two reservoirs, two switchyards, a Government camp and residential housing, two water and sewage systems, the Bighorn Canal headworks, and miles of road and fences.

**Yellowtail Powerplant
100-500 MW**

River:	Bighorn River	Plant Type:	Conventional
Powerhouse Type:	Above Ground	Turbine Type:	Francis
Original Nameplate Capacity:	250,000 kW	Installed Capacity:	250,000 kW
Year of Initial Operation:	1966	Age:	38 years
Net Generation (FY-2003):	310.5 GWh	Rated Head:	440 feet
Average Plant Factor (FY-2003):	14.3 percent	Remotely Operated:	Yes
Production Mode:	Peaking		

Click here for information on the [Yellowtail Dam](#).

Click here for information on the [Pick-Sloan Missouri Basin Project - Yellowtail Unit](#).

Ancillary Services

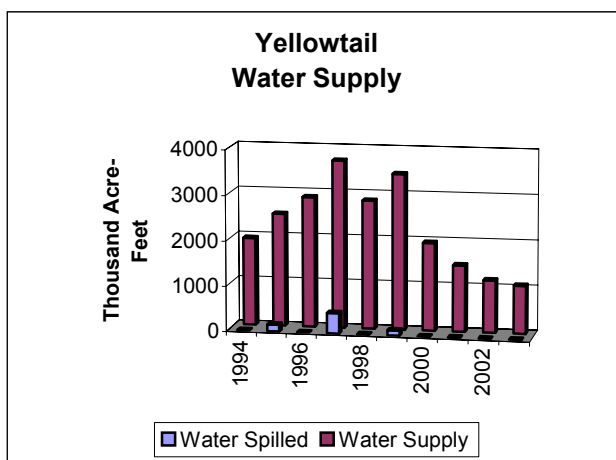
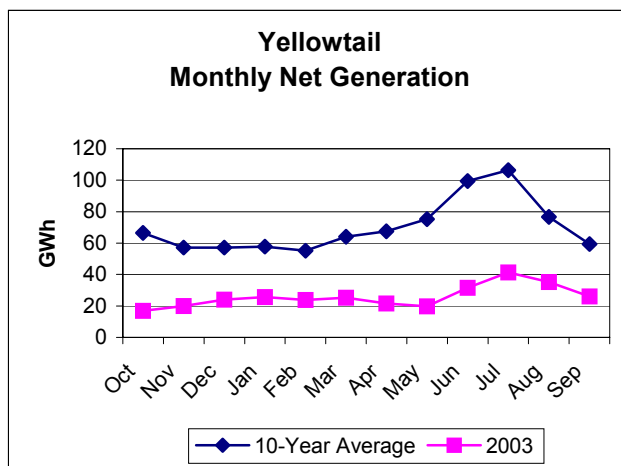
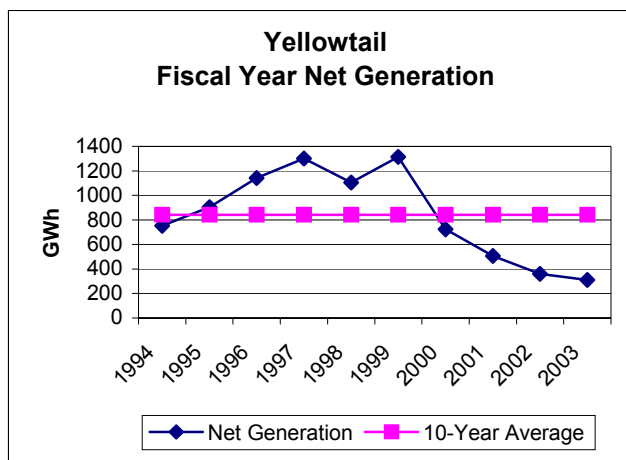
Yellowtail Ancillary Services	
Spinning Reserve	Yes
Non-Spinning Reserve	Yes
Replacement Reserve	Yes
Regulation/Load Following	Yes
Black Start	Yes
Voltage Support	Yes

Generators

Yellowtail Generators Existing Number and Capacity			
Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	62,500	0	62,500
2	62,500	0	62,500
3	62,500	0	62,500
4	62,500	0	62,500
4 Units	250,000	0	250,000

Yellowtail Powerplant 100-500 MW

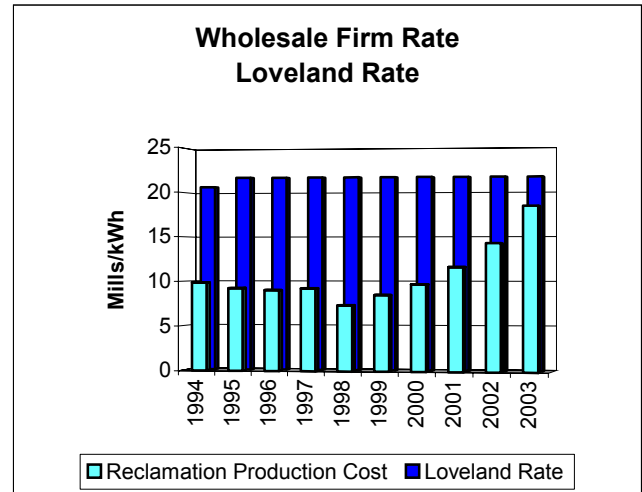
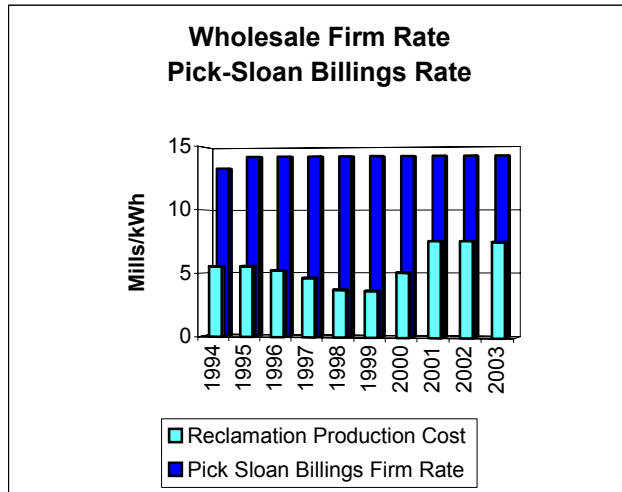
Generation



Drought conditions encountered for the fourth consecutive year.

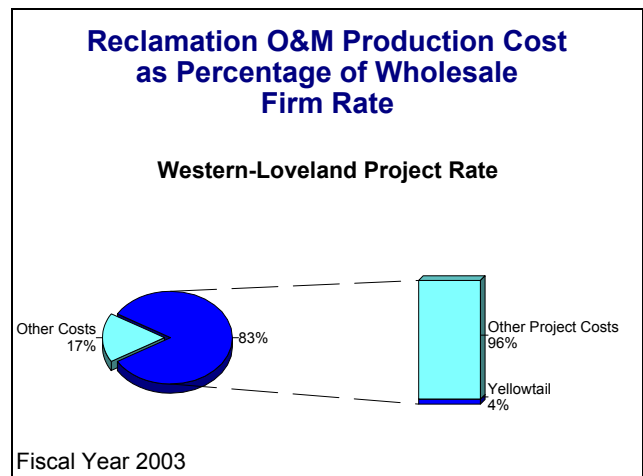
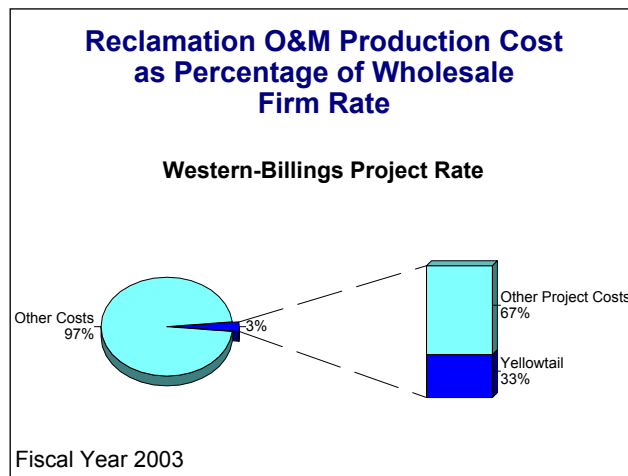
Prime Laboratory Benchmarks

Benchmark 1 Wholesale Firm Rate



Yellowtail Units 1 and 2 are part of the Pick-Sloan Billings Rate and Yellowtail Units 3 and 4 are part of the Pick-Sloan Loveland Rate.

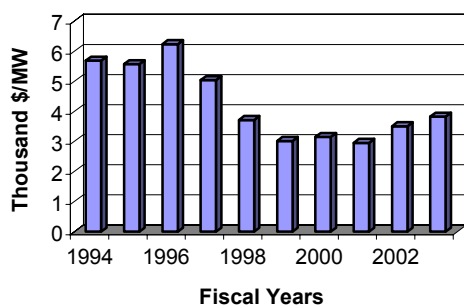
Benchmark 2 Reclamation's Production Cost as Percentage of Wholesale Firm Rate



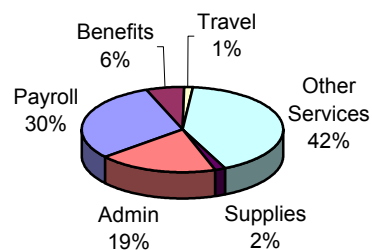
Yellowtail Units 1 and 2 are part of the Pick-Sloan Billings Rate and Yellowtail Units 3 and 4 are part of the Pick-Sloan Loveland Rate.

**Benchmark 3
Production Cost**

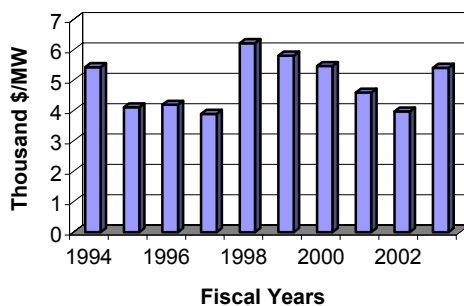
**Yellowtail
Operation Costs**



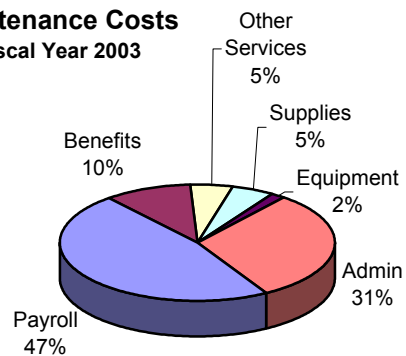
**Yellowtail
Operation Costs
Fiscal Year 2003**



**Yellowtail
Maintenance Costs**

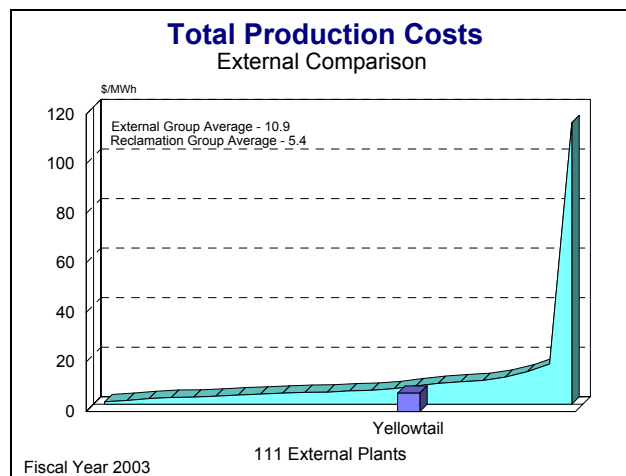
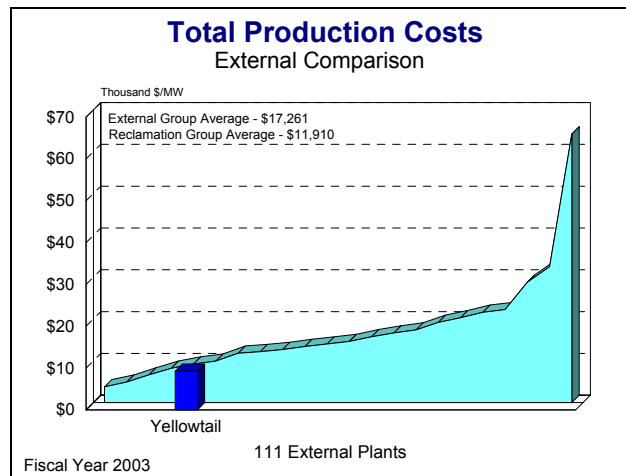
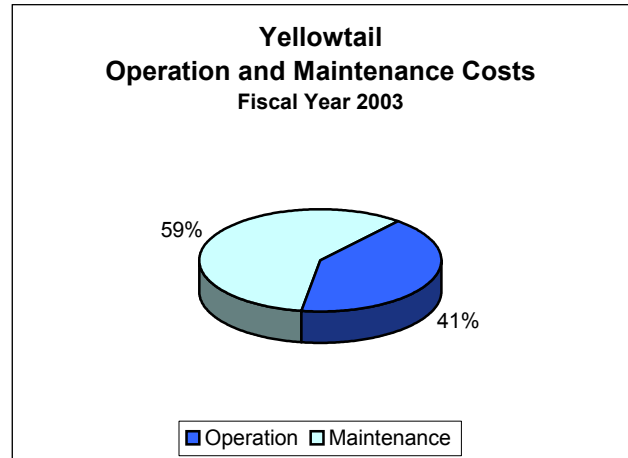
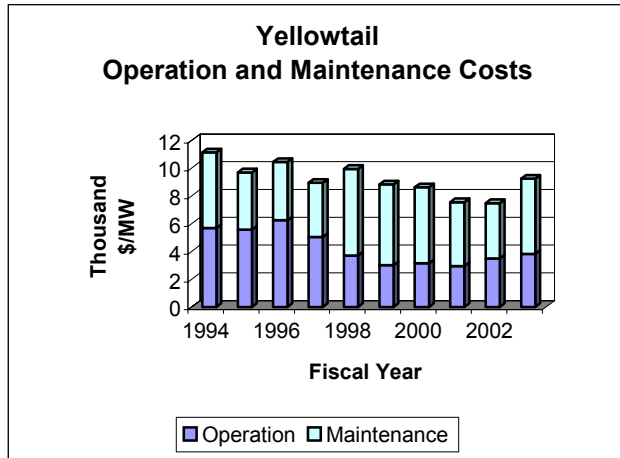


**Yellowtail
Maintenance Costs
Fiscal Year 2003**



Yellowtail's FY-2002 maintenance costs include extraordinary maintenance costs for power penstocks refurbishment design and specification.

**Benchmark 3
Production Cost**

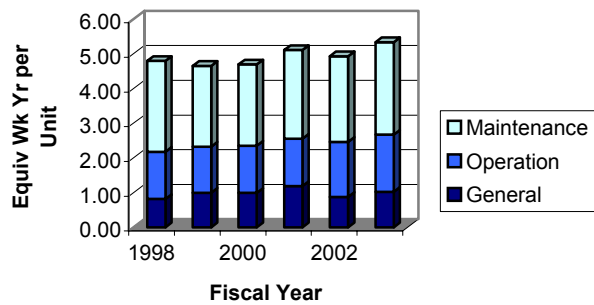


**Benchmark 4
Workforce Deployment**

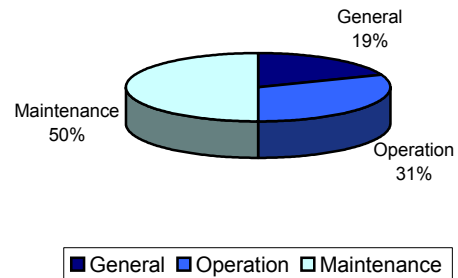
**Yellowtail
FY-2003 Equivalent
Work Year Staffing Levels**

	Equiv Work Year Charged to Powerplant	Leave Additive	Denver and Washington Equiv Work Year Additive	Total Equiv Work Year Allocated to Powerplant	Total Equiv Work year per Generating Unit	Total Equiv Work Year per Megawatt
General	3.62	0.39	0.09	4.09	1.02	0.02
Operation	5.94	0.64	0.00	6.58	1.64	0.03
Maintenance	8.90	0.96	0.00	9.86	2.67	0.04
Total Staffing	18.46	1.98	0.09	20.53	5.34	0.08

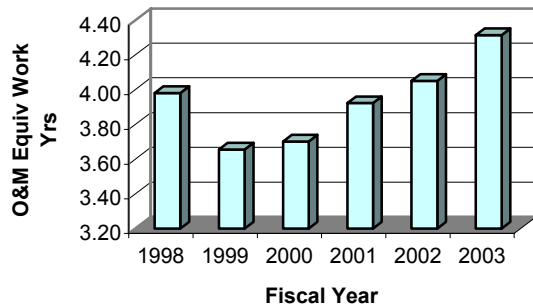
**Yellowtail
Equivalent Work Year per Unit**



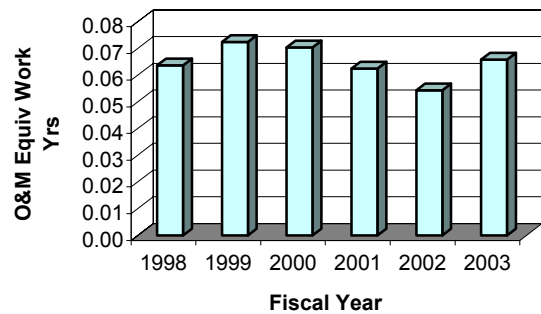
**Yellowtail
Equivalent Work Year per Unit
2003**



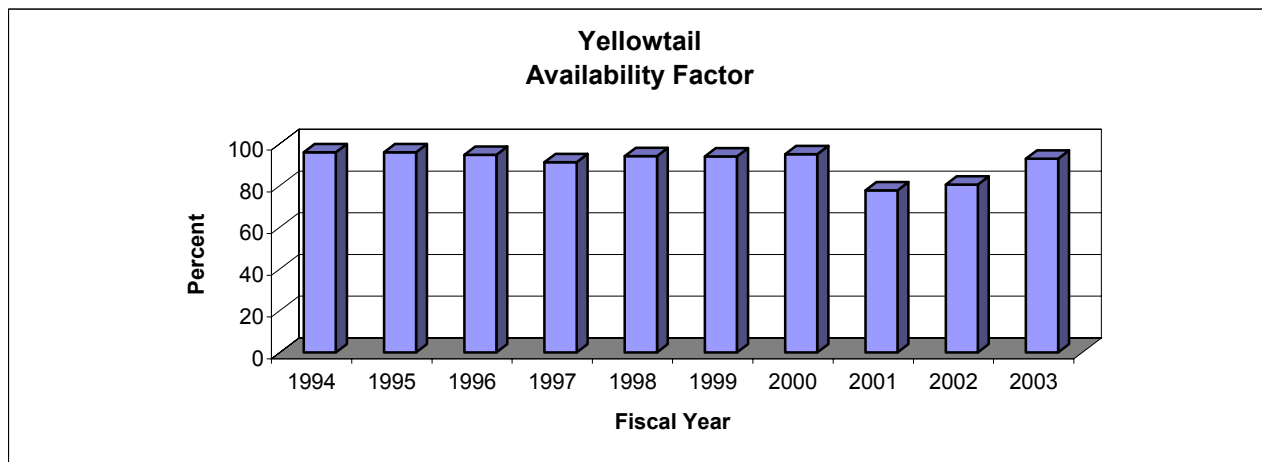
**Yellowtail
O&M Equivalent Work Years per Unit**



**Yellowtail
O&M Equivalent Work Years per MW**

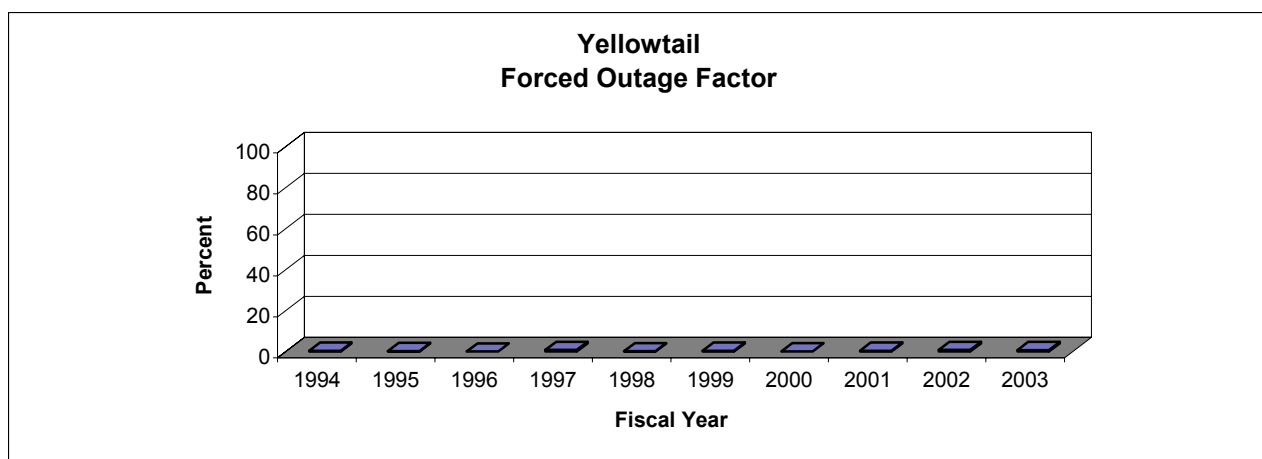


**Benchmark 5
Availability Factor**

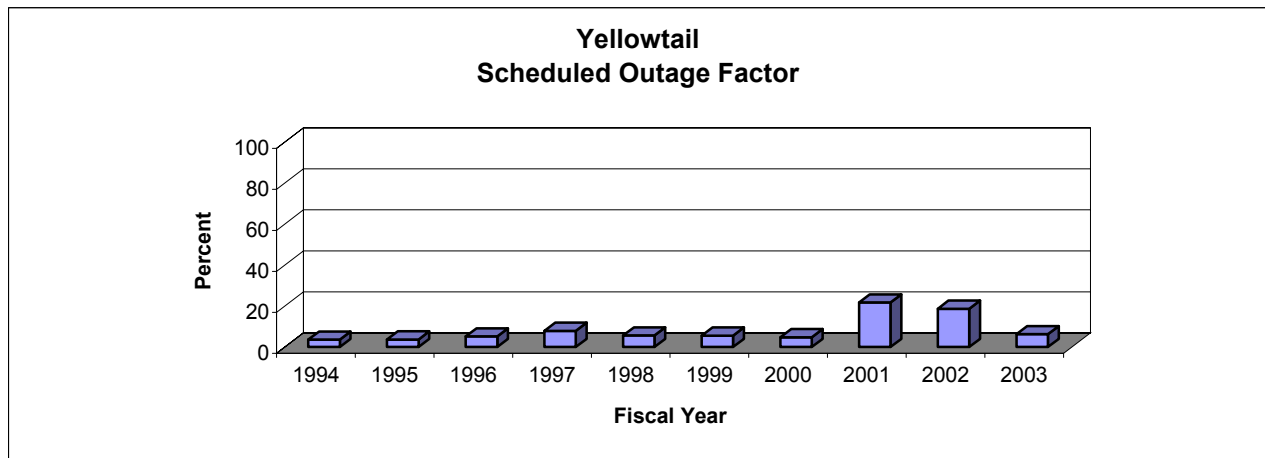


FY-01 and FY-02 – Extended outages occurred for replacing of the turbine runners on Units 3 and 4, and for replacing the governors and excitation systems on Units 1, 2, 3, and 4.

**Benchmark 6
Forced Outage Factor**

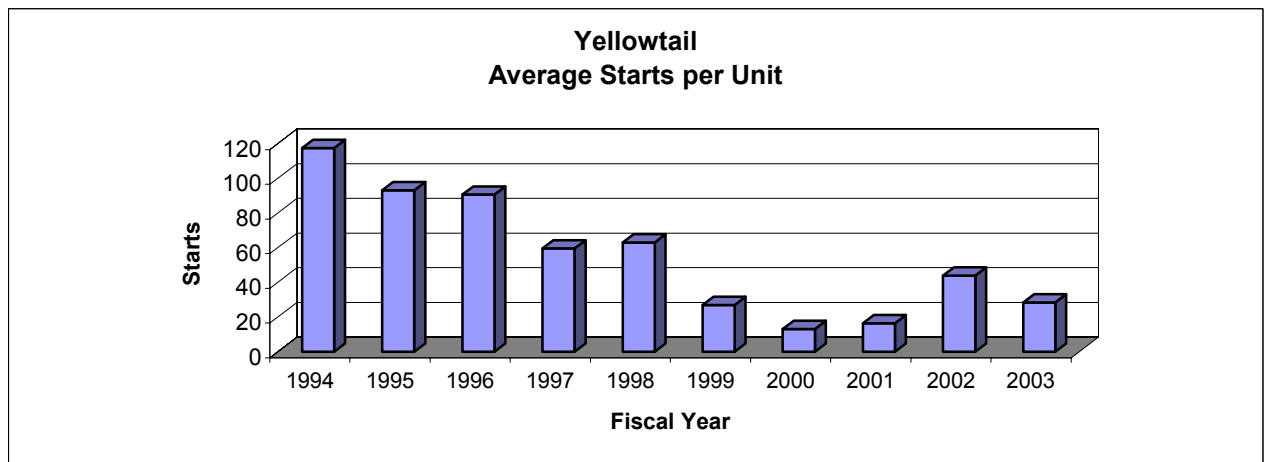


**Benchmark 7
Scheduled Outage Factor**



FY-01 and FY-02 – Extended outages occurred for replacing the turbine runners on Units 3 and 4, and for replacing the governors and excitation systems on Units 1, 2, 3, and 4.

Starts



Benchmark Data Comparison

Fiscal Year 2003	Yellowtail Powerplant	Reclamation Average 100-500 MW Group	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	Units 1&2 14.2 Units 3&4 21.7	Not Applicable	*23.1	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	Units 1&2 1.0 Units 3&4 3.4	Not Applicable	12.0%	Not Applicable	Not Applicable
O&M Cost \$/MWh	7.4	4.5	2.7	10.9	1.1
O&M Costs \$/MW	9,242	10,924	7,315	17,261	3,108
O&M Equip Work Year per MW	0.1	0.1	0.04	Not Available	0.010
Availability Factor	92.9	87.6	83.6	**88.9	99.1
Forced Outage Factor	0.8	0.8	1.5	**2.4	0.0
Scheduled Outage Factor	6.3	11.7	14.9	**8.7	0.0

*Weighted by Net Generation
**2002 NERC Average

The Bighorn River Basin experienced its fourth consecutive year of drought conditions in FY-2003, which resulted in below average generation.

Yellowtail Units 1 and 2 are part of the Pick-Sloan Billings Rate and Yellowtail Units 3 and 4 are part of the Pick-Sloan Loveland Rate.